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NEW OR INTERESTING TROPICAL AMERICAN DOTHIDEALES—I.

CARLOS E. CHARDON

(WITH PLATE 27 AND ONE TEXT FIGURE)

The tropical American species of Dothideales treated in Theissen and Sydow (**1**) are mostly confined to continental South America; the West Indian species were little known at the time of the publication of that monograph. Recent mycological work in Porto Rico as compiled by Seaver and Chardon (**2**) shows that 32 out of 73 species have been described as new by different workers. This shows that a large percentage are strictly Porto Rican or, at least, West Indian, when compared with the forms which are known to occur on the mainland. A large amount of territory, chiefly Cuba, Santo Domingo and most of the Lesser Antilles, remains to be covered. The known Cuban collections are meager, and have been accidentally picked up by botanists interested in higher plants; Santo Domingo was visited a year ago, by Dr. F. D. Kern and Mr. Rafael A. Toro, and a number of Dothideales, mostly belonging to the genus *Phyllachora*, have been lately reported by Toro (**3**). As to the rest of the West Indies, little or nothing is known about them. Thus there seems to be a vast field of investigation for systematic mycologists in all these islands. Mexico, Central America and northern South America are very little known also, as regards this special group of fungi.

The present paper describes a number of new or interesting

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forms. It has been based on collections examined at the New York Botanical Garden, on the Kern and Toro collections of Santo Domingo and on the writer's collections from Porto Rico. The colored plate accompanying the paper has been drawn by Mario Brau, of the Museum of the Department of Agriculture of Porto Rico.

DOTHIDEACEAE

Dothichloe nigricans (Speg.) comb. nov.

Epichloe nigricans Speg. Anal. Soc. Ci. Argent. **19**: 47. 1885. Not *Dothichloe nigricans* (Speg.) Seaver in Stevenson, Jour. Dept. Agr. Porto Rico **2**: 151. 1918.

Specimens collected in Porto Rico by Whetzel and Olive on *Ichnanthus pallens* Munro and erroneously reported by Stevenson as *Dothichloe nigricans* (Speg.) Seaver were described as *Dothichloe subnodosa* sp. nov. by the writer (Mycologia **13**: 287). It was found to differ widely from *Epichloe nigricans* Speg., type material of which was made available by the late Dr. Carlos Spegazzini.

Two other specimens from tropical America have been lately examined by the writer both of which compare favorably with the type of *Epichloe nigricans* Speg. Their stromata are 3–6 mm. long, and completely encircle the host, hence a new combination under *Dothichloe* is proposed here. In *Dothichloe subnodosa* Chardon, the stromata are small, 1–3 mm. in diameter and rarely encircle the host.

On *Panicum polygonatum* Schrad.

BRITISH GUIANA: A. S. Hitchcock No. *16691*, Georgetown, Nov. 6, 1899.

On *Panicum* sp.

CUBA: Collected by N. L. Britton and P. Wilson, no number, deposited in part in Chardon's herbarium No. *1535*, Prov. de Santa Clara, Sept. 4, 1903.

PHYLLACHORACEAE

Trabutia conspicua sp. nov.

Spots very irregular, fully occupied by the stromata; stromata black, shiny, slightly raised over the surface of the leaf, at first small, 2–5 mm. in diameter, angular, later coalescing into large,

conspicuous, tar-like spots, exceedingly irregular, sometimes star-shaped, 1–2 cm. in diameter, stromata between the cuticle and the epidermis (?); locules several in a stroma; 200–300 μ long, 150–180 μ wide; asci cylindrical-clavate, 8-spored, 110–120 $\times$ 15–20 μ; spores uniseriate above, biseriate in the main body of the ascus, elliptical, hyaline, continuous, 20–22 $\times$ 6–7 μ; paraphyses present (PLATE 27, FIG. 4).

This species is referred with some hesitancy to *Trabutia*, since the position of the stroma in the leaf was not clearly ascertained. It is a very conspicuous species on account of the large irregular or rather labyrinthiform, black stromata.

On *Capparis Grisebachii* Eichl.

CUBA: Exploration of Cuba (Britton, Earle and Wilson) No. *5959*, Rio San Juan, Prov. Santa Clara, Mar. 24–25, 1910 (*type*).

Catacauma portoricensis sp. nov.

Spots large, yellowish, equally visible from both sides of the leaf, 1–3 cm. in diameter, possessing many stromata; stromata black, not shining, angular, 2–4 mm. across, following the veins of the leaf and often confluent, more pronounced on the under surface, distinctly situated between the epidermis and the mesophyll; locules several, 2–4 in each stroma, angular through lateral pressure, 300–400 $\times$ 200–250 μ; asci cylindrical, 100–120 $\times$ 9–12 μ, 8-spored; spores navicular, uniseriate or partially biseriate, pointed toward one end, obtuse toward the other, continuous, hyaline, possessing a large drop of oil, 21–23 $\times$ 6–7 μ; paraphyses present.

On *Ficus Stahlii* Warb.

Cross sections of the stromata of this interesting species show plainly the position of the stroma in the tissues of the host. The row of epidermal cells is seen distinctly above the black stromata, indicating that the stroma is located between the epidermis and the mesophyll of the leaf. This stromatic character makes the fungus fall under the Scirrhiineae of the Phyllachoraceae, in the treatment of Theissen and Sydow. In the fresh material a whitish, gelatinous substance was oozing out of the individual stromata on the under surface of the leaves. A microscopical examination of this substance showed it to consist of an immensely large number of spores which are being liberated. This occurred right after a rain. This rather unique method of spore liberation in one of the Dothideales has never before been seen by the writer.

PORTO RICO: Chardon No. *1543*, Quebradillas, Mar. 17, 1922 (*type*); Chardon No. *1608*, Sabana Hoyos, Aug. 26, 1922.

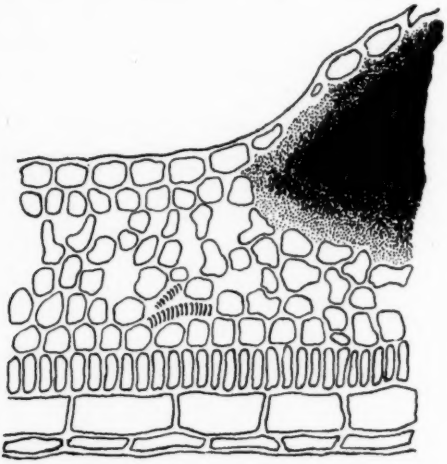

FIG. 1. *Catacauma portoricensis*. Cross section of stroma

Catacauma Brittoniana sp. nov.

Spots large, yellowish, 10 to 15 mm. in diameter, very conspicuous on the under surface of the leaf, scarcely so on the upper surface, possessing many confluent stromata; stromata black, not shiny, 2–5 mm. across or even more through the coalescence of various stromata, largely raised and very pronounced on the under surface, sometimes but not always following the veins of the leaf, distinctly situated between the epidermis and the mesophyll; locules several, 2–7 in each stroma, flattened, or angular through lateral pressure, 300–360 × 150–200 μ; asci cylindrical-clavate, 66–82 × 10–12 μ, 8-spored; spores navicular, uniseriate above, biseriate in the main body of the ascus, continuous, hyaline, 15–18 × 4–5 μ, possessing one or several oil drops; paraphyses present, profuse (PLATE 27, FIG. 1).

On *Ficus subscabrida* Warb.

A cross section of the stroma of this species, like the previous one, showed it to be distinctly between the epidermis and the mesophyll. In sections of very young stromata, the epidermal cells of the leaf of the host showed clearly above the stromatal tissue. The species thus appears to be a true *Catacauma*, unlike any other species described.

ISLE OF PINES: Explorations of Cuba No. *15472* (Britton, Britton & Wilson), San Juan, Mar. 15–17, 1916 (*type*).

Phyllachora Kerniana sp. nov.

Stromata amphigenous, black, shining circular, 1 mm. or less in diameter on the upper surface, not shining but more prominent (papillate) on the under surface, seldom coalescing, uniloculate; locules subglobose, fairly regular, distinctly immersed in the mesophyll, 185–250 μ long, 120–150 μ wide; asci cylindrical-clavate, 72–90 $\times$ 12–16 μ, 8-spored; spores uniseriate above, biseriate in the main body of the ascus, ellipsoidal, 14–17 $\times$ 6–7 μ, hyaline, continuous; paraphyses present (PLATE 27, FIG. 2).

On *Catalpa longissima* Jacq.

The small punctiform stromata protruding in the under surface of the leaf is very characteristic of this species.

SANTO DOMINGO: Kern & Toro No. *225*, La Vega, Mar. 17, 1926 (*type*).

Phyllachora inconspicua sp. nov.

Stromata amphigenous, black, shining, 1 mm. in diameter on the upper surface, rarely confluent, also small, inconspicuous and brown on the under surface, uniloculate; locules subglobose or irregular, distinctly immersed in the mesophyll, 180–300 μ long, 100–150 μ wide; asci elliptical-clavate, 70–95 $\times$ 12–18 μ, 8-spored; spores uniseriate above, biseriate in the main body of the ascus, ellipsoidal, 13–15 $\times$ 7–8 μ, hyaline, continuous; paraphyses present.

On *Stigmaphyllon lingulatum* (Poir.) Small.

The material examined is full of the rust *Puccinia inflata* Arth., whose purple shiny sori must not be confused with the stromata of this new *Phyllachora*. A very rare species only known from a single collection.

PORTO RICO: Cornell University Explorations of Porto Rico (C. E. Chardon) No. *901*, Peñuelas, July 30, 1920 (*type*).

Phyllachora domingensis sp. nov.

Stromata amphigenous, black, not shiny, very conspicuous, 1–2.5 mm. in diameter, more or less circular, equally visible from both surfaces of the leaf, plurilocular; locules globose, flattened, distinctly immersed in the mesophyll, 220–380 μ long, 160–220 μ wide; asci cylindrical or cylindrical-clavate, 85–110 $\times$ 11–15 μ, 8-spored; spores uniseriate, or partially biseriate, long elliptical,

somewhat pointed at the end, 18–22 × 5–6 μ, hyaline, continuous; paraphyses present.

On *Picramnia pentandra* Sw.

This species is distinctly new, and evidently different from other Phyllachoraceae on *Picramnia* in Theissen and Sydow which fall under different genera, as *Endodothella* and *Telimena*.

SANTO DOMINGO: Kern & Toro No. *187*, San Cristóbal, Mar. 14, 1926; Kern & Toro No. *268*, Santiago, Mar. 21, 1926 (*type*).

Phyllachora Eugeniae sp. nov.

Spots amphigenous, appearing as discolored circular areas, later fully occupied by the stromata; stromata black, shiny, 1 to 2.5 mm. in diameter, roughly circular on the under surface, not shiny, smaller and less conspicuous on the upper surface, pluriloc-ular, fully occupying the mesophyll; locules globose or subglobose, 110–150 μ long, 80–130 μ wide; asci cylindrical, 8-spored, 60–75 × 7–9 μ; spores obliquely uniseriate, or biseriate in the main body of the ascus, ellipsoidal, hyaline, continuous, 8–10 × 4–4.5 μ; paraphyses present.

On *Eugenia rhombea* (Berg.) Krug & Urban.

This species is distinct from others reported on *Eugenia*. *Phyllachora biareolata* Speg. is known from Brazil, Argentine and Paraguay, but the type species which has been examined shows a very characteristic and regular zone of dead tissue around the stromata bordered by a conspicuous black margin which is not present in our specimen. Seaver (**4**) reported the occurrence of *P. biareolata* Speg. on *Eugenia rhombea* in Saint Croix "although no authentic material had been seen." Certainly, our Porto Rican material is not that species. It also differs widely, in both stromatal and spore characters, from *Phyllachora Whetzelii* Chardon, also on *Eugenia* from Porto Rico and Santo Domingo.

PORTO RICO: University of Illinois, Porto Rican Fungi (F. L. Stevens) No. *321*, Guánica, Feb. 3, 1913 (*type*).

PHYLLACHORA ULEI Winter, Grevillea **15**: 90.

On *Rajania cordata* L. and *Dioscorea* spp.

This conspicuous and beautiful species seems to be common in Porto Rico, but appears to be heretofore unreported from the island. The stromata are shining black, 2–5 mm. in diameter and more or less rounded. The spores in Winter's species are

18–20 × 5–6 μ; in the material examined they appear to be smaller, 12–13 × 5–6 μ, but this difference is scarcely sufficient to warrant the erection of a new species. Perhaps it might be considered as a variety of *P. Ulei* which is only known to occur in the continent of South America (PLATE 27, FIG. 3).

PORTO RICO: Fink No. *459*, Rio Piedras, Nov. 30, 1915; Stevenson No. *3459*, Rio Piedras, Dec. 12, 1915; Stevenson & Rose No. *5797*, Rio Piedras, Nov. 17, 1916; Chardon No. *1539*, Las Cruces, Mar. 29, 1922.

PHYLLACHORA WHETZELII Chardon, Mycologia **13**: 293. 1921.

On *Eugenia monticola* Sw.

This appears to be the first report of this species outside of Porto Rico, where it was supposed to be endemic. The material seems to be identical with the *type*.

SANTO DOMINGO: Kern & Toro No. *188*, San Cristóbal, March 14, 1926.

RIO PIEDRAS, PORTO RICO

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EXPLANATION OF PLATE 27

Fig. 1. Under surface of leaf of *Ficus subscabrida* showing stromata of *Catacauma Brittoniana* (4/5 nat. size).

Fig. 2. Under surface of leaf of *Catalpa longissima* showing minute stromata of *Phyllachora Kerniana* (4/5 nat. size).

Fig. 3. Under surface of leaf of *Dioscorea* sp. showing tar-spot stromata of *Phyllachora Ulei* Winter (4/5 nat. size).

Fig. 4. Upper surface of leaf of *Capparis Grisebachii* showing labyrinthiform stromata of *Trabutia conspicua* (4/5 nat. size).

HETEROTHALLISM IN BLAKESLEA TRISPORA

GEORGE F. WEBER AND FREDERICK A. WOLF [1]

(WITH PLATES 28–30)

During the summer of 1925 the phycomycetous fungus, *Blakeslea trispora* Thaxter, appeared at Gainesville, Florida, as a contaminant in planted plate cultures of fungous sclerotia made by the senior writer (1).[2] It was soon afterward isolated from the surface of lesions on cucumber leaves. Several plantings of sporangiospores were made at that time on potato agar plates and it was noted after 24 hours that a line of zygospores bordered one of the colonies resultant from these plantings. Since this organism had hitherto been known only in its sporangial stage, a study was begun to determine the conditions necessary for the formation of zygospores. These studies have shown that this phenomenon is dependent upon the presence of two strains which according to terminology employed with other dioecious fungi are designated as the plus (+) strain and the minus (−) strain respectively. They are usually distinguishable in pure culture by the number and size of the sporangia, the more fruitful one being plus and the less fruitful, minus. Dr. A. F. Blakeslee after studying these strains verified this observation and conclusion. The fruitfulness, however, is not a dependable criterion since under certain conditions sporangia are not produced in either strain.

[1] George F. Weber, Associate Plant Pathologist, Florida Agricultural Experiment Station, Gainesville, Florida.

Frederick A. Wolf, Pathologist, Office of Fruit Diseases, Bureau of Plant Industry, United States Department of Agriculture, Orlando, Florida.

The experimental work of each writer has been done entirely independently. Since that of the senior writer was practically complete before the studies of the junior were begun, and since the results of both are in entire accord, it is deemed best to prepare this report conjointly.

[2] Reported by Weber, George F. Plus (+) and Minus (−) Strains of *Blakeslea trispora* Thaxter, Abst. Bot. Soc. Am. Kansas City, Dec. 1925. (Unpublished.)

The junior writer first noted this peculiar fungus during the summer of 1926 in the vicinity of Orlando, Florida. It was found to be of common occurrence on *Sida acuta*, a malvaceous weed which is of wide distribution in orange groves throughout the state. It appears on the fading flowers but is most conspicuous in late summer after the weeds have been mowed when it covers the withered leaves and stems profusely.

The metallic luster of the sporangiophore stalks presents the appearance, at first glance, of the closely related *Choanephora Cucurbitarum* (Berk. & Rav.) Thaxter, which may be growing interspersed with it on the same substratum. In fact it was at first thought by the junior writer to be a *Choanephora* whose fruiting branches were approximately half as tall as those of the well-known *C. Cucurbitarum*. Because of the dichotomous branching of the fruiting stalks it was tentatively identified as *C. dichotoma*.

An examination of available literature revealed the curious coincidence that this binomial had previously been employed by Gandrup (**4** & **5**) for a species which in Sumatra is associated with a mustiness of freshly picked tobacco leaves. It was furthermore found through correspondence with the Director of the Experimental Station at Deli, Medan, that no technical description of *C. dichotoma* was ever prepared since the fungus was found, on subsequent study by Gandrup and his associates (**4** & **7**), to be identical with *Blakeslea trispora*.

It appears that no studies of this fungus have been made except by Thaxter in 1914 (**6**). The original strain of this fungus from which Thaxter made his description appeared as a contamination in plated cultures of *Botrytis Rileyii* from the velvet bean caterpillar (*Anticarsia gemmatilis* Hbn.) made by Dr. O. F. Burger, in 1912, at Gainesville, Florida. This culture was sent to Dr. Thaxter who two years later published (**6**) the description of the genus and species. Further, the only record of its occurrence outside of Florida appears to be from the reports of Gandrup (**4, 5, 7**). Special consideration will be given in the present report to the morphology and development of the zygosporic stage. The brief recapitulation herein given of the morphology of the sporangial stage confirms entirely the researches of Thaxter.

Blakeslea trispora grows readily on agar media. Cultures 24 to 48 hours old bear at the same time sporangia of several types, together with chlamydospores and zygospores, and the plant is therefore to be regarded as especially favorable for study. The mycelium in culture forms a dense cottony mass that usually shows shades of orange or yellow at the surface of the medium. This is particularly true when the fungus is growing on 2 per cent potato dextrose agar. When growing on 5 per cent agar the orange coloring is much more intensified and in this case few or no sporangia are developed. In development the sporangia are distinctly heliotropic and will change in a few hours when the culture is turned 180° from the source of light. The production of sporangia is influenced very little by light since they grow profusely in bright or subdued light and in total darkness. The intensity of the light, however, modifies the length of the sporangiophore, the shortest being produced in bright light. When sporangiophores are formed in culture, there is no evidence of a metallic luster such as occurs in its natural habitat. The fertile hyphae of most common occurrence are dendroid, dichotomously branched structures whose branches and branchlets are nodose in outline and bear at the tips globular sporangioliferous heads (PLATE 30, FIGS. 1 AND 2). The number of these ultimate heads varies from two to thirty-two, with a corresponding variation in size of the supporting stalk. From thirty to forty broadly elliptic sporangiola are borne on the surface of each sporangioliferous head. These sporangiola are attached by short stout stalks which, when the sporangiolum is removed, may remain attached to the head (PLATE 30, FIG. 3). If instead it adheres to the sporangiolum, it assumes the form of an elliptical vesicle (PLATE 30, FIG. 8). Each sporangiolum contains typically three elongate, elliptical spores whose long axis is parallel to the long axis of the sporangiolum. The spores while within the sporangiola are compressed along the opposed faces but become rounded out on being set free. They are purplish brown in color and their surface is marked by longitudinal striations with ramifications extending between striae. A tuft of very fine appendages, approximating the length of the spores, arises at either pole (PLATE 30, FIGS. 4 AND 5). The sizes of the spores average $12 \times 6\ \mu$, with a range of 8 to 18 by 5 to 8 μ.

In addition to the sporangia which have just been described, others of the type characteristic of the genus *Choanephora* have always appeared in cultures and are common in the stems of *Sida*. These sporangia are extremely variable in size and in the size and number of spores which they contain. In culture they usually appear a day or two after the larger forms already described. The larger (PLATE 30, FIG. 7) average 50 to 75 μ in diameter and possess a columella. This structure is absent in the smaller whose diameter may be 14 to 16 μ (PLATE 30, FIG. 6). As Thaxter has pointed out, every imaginable intermediate condition between a form represented in Plate 30, Figure 7, and a three-spored sporangium may be met with, so that no clear-cut distinction between the two types of sporangia remains. These sporangia of this second type are nodding or circinate and only rarely erect. The columella of the larger sporangia is broadly elliptical. The sporangial wall of the smaller is incrusted with angular spicules. The six to eight spores borne in the smaller ones may be twice as large as those in the large sporangia. All are alike, however, in the possession of a finely corrugated wall and polar appendages. All germinate readily within a few hours by the production of lateral or terminal germ tubes (PLATE 30, FIG. 5).

Chlamydospores are formed especially in old cultures. They are globular to ovoid in shape (PLATE 30, FIG. 12).

Two methods have been employed in isolating the two strains. When sporangiospores "en masse" from the two sides of the line of zygospores were planted on another plate, a line of zygospores was formed again at the juncture of the two resultant colonies. The colonies from both strains are alike in appearance except that the one which has been designated plus usually forms sporangia more abundantly. Further, neither strain when planted alone will produce zygospores (PLATE 28). When, however, both strains are planted together, as has been done months after their isolation, they behave just as was the case when they were first isolated (PLATE 29).

The two strains have been isolated also from single spores by repeated dilution of a suspension of spores and planting in poured plates. As soon as growth had begun, as determined by microscopic examination through the bottom of the Petri dish cultures,

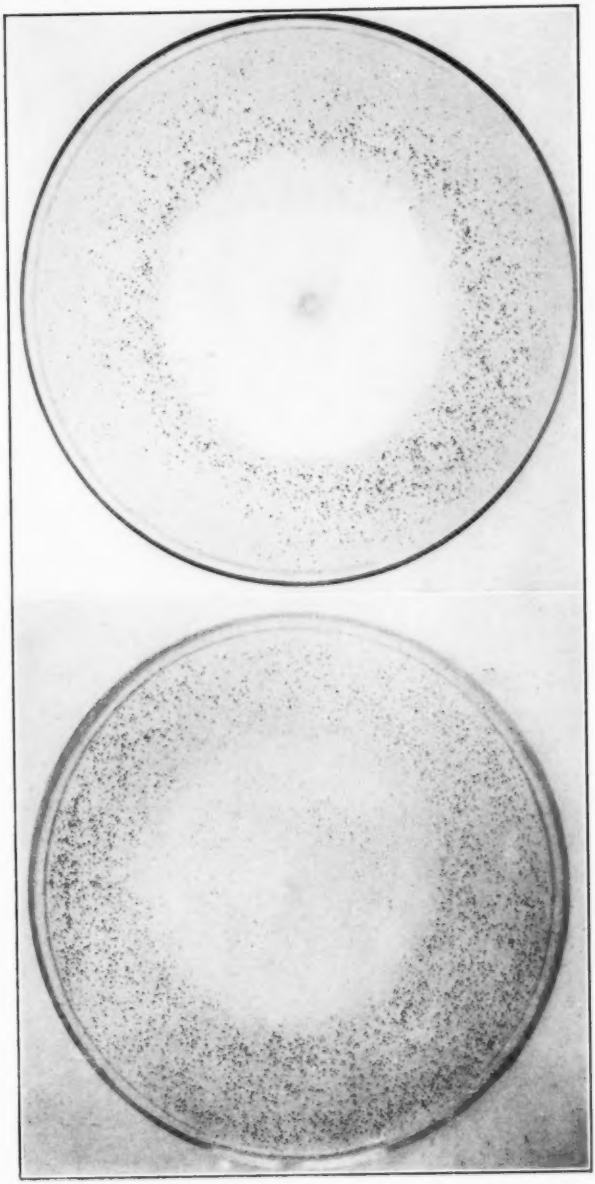
the spores were cut out with a block of surrounding agar. Of thirteen isolations made in this manner two proved on subsequent trial to be of one strain and eleven of the other.

The process of zygospore formation is essentially like that which has been described for *Choanephora* as illustrated by *C. infundibulifera* (**3**), *C. Cucurbitarum* (**8**), and *C. conjuncta* (**2**). The hyphae of the two strains are first noted to be more or less closely entwined. The tips of these hyphae next become enlarged and densely filled with granular protoplasm after which a septum is formed which delimits each progamete. Each progamete then divides into two which results in the separation of the gamete and suspensor (PLATE 30, FIG. 10). The wall between adjacent gametes becomes flattened on the opposed faces, that portion in contact is absorbed, and the two gametes fuse. Then as the young zygote increases in size the two saccular suspensors become clear and are devoid of protoplasmic content (PLATE 30, FIG. 9). As the zygospore approaches maturity the numerous oil globules within it fuse to make one large central globule. Meanwhile the exospore has thickened and become dark brown in color. At maturity the zygospore is supported from the lower side by the two suspensors and is either globular in outline or slightly flattened on the lower side. The zygospores measure 38 to 61 by 45 to 63 μ (PLATE 30, FIG. 11).

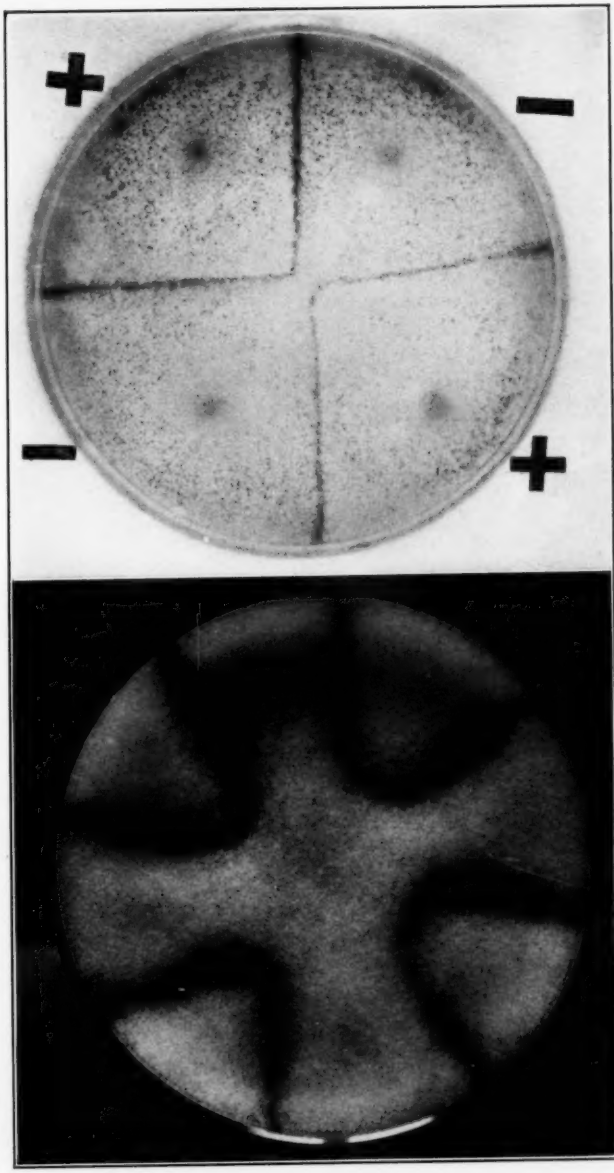
The fact that the zygospores of *Blakeslea* and *Choanephora* are so similar adds to the proof of their close relationship as indicated by Thaxter (**6**). Furthermore, as he points out, the close correspondence of the sporangiola of the former with the conidia of the latter, in form, color, striation and origin from vesicular heads, shows that they are homologous and that the conidia of *Choanephora* may appropriately be regarded as monosporous sporangia.

SUMMARY

Blakeslea trispora Thaxter, which has hitherto been known only in the sporangial stage, has been found to produce zygospores. Zygospore production is dependent upon the presence of the plus (+) and minus (−) strains. The only apparent difference in the two strains is the ability of the one to produce sporangia in greater abundance.



BLAKESLEA TRISPORA



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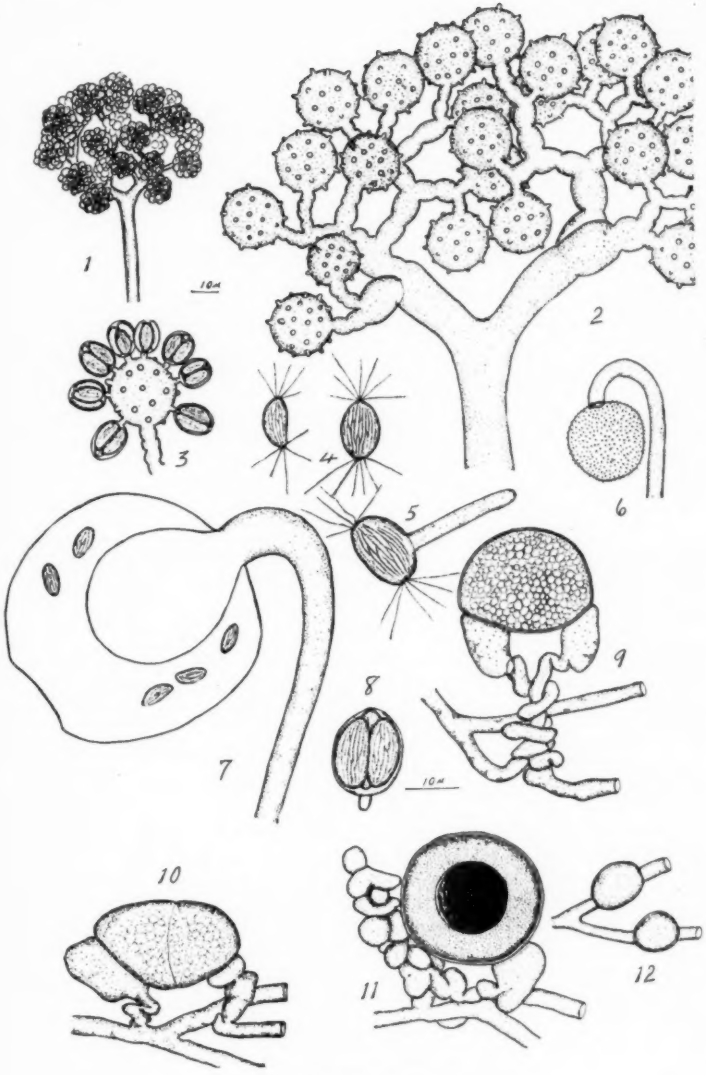

BLAKESLEA TRISPORA

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EXPLANATION OF PLATES

PLATE 28

Blakeslea trispora in culture. Upper, plus strain, lower, minus strain, showing more profuse development of sporangia by the former.

PLATE 29

Lines of zygosporic production. Adjacent quadrants of opposite sex in upper figure. Alternate plantings of opposite sex in lower figure resulted in formation of maltese cross by lines of zygospores.

PLATE 30

Figs. 2, 3, 6, 7, 9, 10, 11 and 12 drawn to scale above Fig. 3. Figs. 4, 5 and 8 to scale near Fig. 8.

Fig. 1. Habit sketch of fruiting branch of *Blakeslea trispora;* Fig. 2. Dichotomously branched sporangiophore with sporangioliferous heads from which the sporangioles have been removed; Fig. 3. Sporangioliferous head with a portion of sporangioles in situ; Fig. 4. Sporangiospores; Fig. 5. Sprouting sporangiospore; Fig. 6. Small nodding sporangium of the kind which lacks a columella; Fig. 7. Large nodding sporangium with columella; Fig. 8. Sporangiolum with hyaline vesicular stalk; Fig. 9. Zygospore filled with oil droplets supported by suspensors and coiled hyphae; Fig. 10. Gametes in stage just prior to dissolution of walls and fusion of gametes; Fig. 11. Mature zygospore with large oil drop and thick exospore; Fig. 12. Chlamydospores.

NEW OR OTHERWISE INTERESTING AGARICACEAE FROM THE UNITED STATES AND CANADA [1]

LOUIS C. C. KRIEGER

(WITH PLATES 31–36)

Agaricus auricolor n. sp. (PL. 36, FIG. 2.)

Pileus campanulate, not over 4 cm. broad, bright cadmium yellow on the disk, the rest of the surface white or whitish and adorned with cadmium-colored squamules; margin thin, split, bearing traces of the white veil. Gills narrow, smoky chocolate colored inclining toward brown, connected near the stem which they approach closely but to which they are not attached. Stem about 4.5 cm. long, 7.5 mm. thick above, tapering downward almost to a point, white and smooth above the ring, below it loosely white-squamulose, stained yellow at the base, hollow-stuffed within; flesh turning yellow. Ring markedly developed, thin but somewhat persistent, flaring, the edge dentate with small adhering yellowish protuberances. Spores $5.5 \times 3.3\ \mu$ (usual size).

Found by Dr. Frederick J. Wilkens, near State Sanatorium, Md., July 26, 1922. No. *1521*.

At first I was inclined to regard this plant as a species of *Stropharia*, but the free gills forbade such a reference. The specimen was perfectly fresh when it was placed in my hands. The pointed stem is a remarkable feature. It resembles *Stropharia obturata* Fries.

Amanita brunnescens var. **pallida** n. var.

Some specimens, even young ones, are very pale (even white), with the other characters the same as in the typical form. Found near Magnetawan, Ontario, Canada, July 22, 1921. Nos. *941*, *1613* and *1870*.

Amanita corticelli (Valenti-Serini) n. comb. (PL. 32, FIG. 1).

(Syn., *Volvaria corticelli* Valenti-Serini, *Amanita lepiotoides* Barla, and *Amanitopsis lepiotoides* Sacc.)

[1] The numbers refer to the specimens preserved in the herbarium of the Howard A. Kelly Mycological Library.

This species, one of the *ovoidea-coccola-barlae* group, seems to be limited in its occurrence to mountainous regions. Some authorities are inclined to regard it as a mere meteorological sport of *A. Coccola*.

Blue Ridge Summit, Md., near Friends Creek, August 20, 1923. Nos. *1415* and *1545*.

Amanita crassivolvata n. sp. (PL. 32, FIG. 2.)

Pileus 8 cm. broad, convex to explanate, very dark brown all over, almost black, especially in the center, virgate, glabrous except for a few small flat darkish volva-patches; margin even, not striate. Gills white, with a pale creamy tinge, close, unequal, 8 mm. broad, slightly narrower toward the stem, and there almost adnately attached. Stem 12 cm. where it enters the pileus, white to pale creamy white, perfectly smooth, the base rounded off and attached to the center of the curiously cup-like white volva. The free limb of the latter thick (about 6 mm.), 1.5 cm. long, and somewhat lobed. Ring yellowish white, moderately large, deflexed, median. Spores hyaline, subglobose, 8.8 × 7.7 μ.

Found at Stow, Mass., October, 1911. Collector, Mr. Simon Davis. No. *841*.

Amanita porphyria var. **lavendula** (Coker) n. comb.

Syn., *Amanita mappa* var. *lavendula* Coker.

Coker's plant is doubtless a variety of *A. porphyria* rather than of *A. mappa*.

Armillaria cingulata Fries.

Magnetawan, Ontario, Canada, September, 1921. Collector Prof. H. C. Beardslee. No. *1366*.

Apparently unreported from North America.

Collybia maculata (Alb. & Schw.) Fries, abortive form. (PL. 31.)

A malformed specimen in which the gills failed to develop. This species is given to the production of monstrous forms, as was shown by Boudier, who described and figured a curious cyclomycetoid specimen. (Bull. Soc. Bot. Fr. **19**: 141. 1872.)

Stow, Mass., September 18, 1909. Collector, Mr. Simon Davis.

Cortinarius rubroclavus n. sp. (PL. 35.)

Pileus 6 cm. broad, expanded, rounded-umbonate, pale yellow with a tinge of dull red, faintly fibrillose-squamulose; margin

decurved. Gills subdistant, pale lemon-yellow at first (no trace of either violet or purple), then inclining to cinnamon; edges eroded. Stem 10 cm. long, 1.5 cm. thick, equal until the conspicuous bulb (3.5 cm. thick) is reached, white but changing rapidly to a deep saffron red (from handling), especially the bulb, solid within and creamy white, with stains of saffron red. Cortina high up on the stem, fibrillose, ferruginous-cinnamon from the spores. Spores $7 \times 5\ \mu$, bright yellow-cinnamon under the microscope, rough-granular within.

Anne Arundel Co., Md., near the Severn River, October 3, 1919. No. *256*.

Peck's *C. albidipes*, though it resembles the present species, has a permanently white stem, and gills that are violaceous when young. *C. Bulliardii* (Pers.) Fries, *C. rubripes* Kauff., and *C. colus* Fries are also different.

Hebeloma hortense Burt.

Grown on a lawn from spawn kindly supplied by Prof. Burt. Several plants came up on the very spot where the spawn had been planted. (No. *922*.) The caps were very finely lacunose under a hand-lens, isabelline colored, darker on the margin (hygrophanous ?). Stem striate above. Mycelium and adhering earth forming a ball at the base of the stem. Odor exactly like that of *Naucoria semiorbicularis* (Bull.) Fries, *i.e.*, powerfully farinaceous, or cucumber-like.

The plants suggested strong kinship, if not identity, with *Naucoria sororia* Peck, a robust "sister" of *N. semiorbicularis*.

Hygrophorus proximus n. sp. (PL. 34, FIG. 3.)

Pileus 5.5 cm. broad, slightly repand, pinkish-creamy, and with a fine purplish-red scattered tomentum that forms darker spots of purple-red on the moderately elevated disk; flesh very thin toward the margin. Gills *very narrow and close*, unequal, creamy white, markedly decurrent. Stem 5 cm. long, 1.2 cm. thick, tapering a little below, white, with a pinkish-lavender tinge, slightly fibrillose with a few purplish fibrils, punctate above with pale tomentose dots. Flesh of stem and pileus solid and white, or very faintly pinkish. While drying, the plant emitted an odor of rancid lard. Spores hyaline, $6.6 \times 4.4\ \mu$.

Collected at Belair, Md., October 7, 1919, by Miss Olga E. B. Kelly. No. *287*.

It seems near *H. erubescens* Fries, hence the specific name.

The gills of my plant are much closer and narrower, and the spores considerably smaller than in the Friesian species.
Lactarius Allardii Coker.

Collected in Gwynn's Falls Park, Baltimore, Md., August 14, 1919, on mossy ground in beech woods. No. *84*.

These plants agreed well with Coker's description, except that the surface of the pileus was a little rugulose in places, and wounds eventually became olive-brown. A fine pinkish bloom was present on the margin of the pileus. The gills were interconnected, and venose at the point of their attachment to the pileus. Stems inclined to whitish on one side. Spots on stem (produced by handling) turned olive-brown. The pink of the flesh took some time to develop, but, once it had started to appear, it soon deepened to a richer shade, finally ending in a dull pink. The somewhat sparse milk turned to a faintly pink tint at first, then to a dirty olive-brown. One specimen, the smaller one, had the margin of the pileus grown fast to the stem.

Mycena inconspicua n. sp.; in the nomenclature of the North American Flora, PRUNULUS INCONSPICUUS. (PL. 36, FIG. 1.)

Pileus up to 7 mm. broad when fully expanded, broadly campanulate, with a rounded disk, brownish-ochraceous, becoming paler with age toward the margin (there almost white); latter straight from the first, striate, the striations conspicuous and reaching almost to the disk; flesh so thin as to appear membranous. Gills subdistant, unequal, white, broad for their size, rounded and ascending toward the stem where they are adnexed; edges entire, concolorous. Stem delicate, about 1.5 to 1.7 cm. long, 1.5 to 2 mm. thick, usually curved, equal or slightly thicker below, white but not shining, finely pubescent under a hand-lens, cartilaginous, tubular. Spores smooth, elliptical, one end somewhat truncate, uniguttulate, slightly pinkish within, $7.7 \times 4.8\ \mu$.

Baltimore, Md., July 20, 1919. Grew cespitosely on naked soil at a street corner. No. *375*.

Near *M. minutissima* Murrill and *M. paupercula* Berk., but neither.

NAUCORIA CHRISTINAE (Fries) Sacc.

In a wood near Lynn, Mass., my colleague, Mr. Hollis Webster, showed me how the pilei of this highly interesting species originate

deep down in the leaf-mold, and how they then punch their way through the overlying leafy débris until the open air is reached and the spores are liberated. The sharp mucronate umbo serves admirably in the performance of this task; indeed, the pileus is little more than umbo, the rest of the flesh being just thick enough to give support to the gills underneath.

PANAEOLUS SOLIDIPES Peck, sterile form.

In Druid Hill Park, Baltimore, Md., among hundreds of normal specimens of this species, I found a single fully grown one that was completely sterile. The gills were of a pallid isabelline color, not in the least black. No. *1645*.

Pluteus leoninus var. **oculatus** n. var. (PL. 36, FIG. 3.)

Differs from the typical species in having the center of the pileus colored a very dark brown. When seen from afar, the pilei simulate Black-eyed Susans (*Rudbeckia hirta*).

Magnetawan, Ontario, Canada, July 29, 1921. No. *1197*.

Pluteus salicinus (Pers.) Fries (PL. 34, FIG. 2.)

Magnetawan, Ontario, Canada, August 18, 1921. No. *1260*. On rotten wood.

As this species has never before been reported from this continent (Kauffman reports merely a very questionable variety of it), I include my notes in full.

Pileus about 6 cm. broad, expanded, with a slight umbo, dark gray from the presence of very fine fasciculate woolly fibrils, which, in parting, give the surface a radiately streaked appearance; central portion densely dotted with very dark small erect flocci, and somewhat greenish; margin not striate. Gills close, unequal, free, rather broad, narrowed posteriorly, of a bright warm pink; edges concolorous, somewhat eroded, under a hand-lens slightly fimbriate, and whitish. Stem about 6 cm. long, 8 mm. thick at the base, tapering upward to a diameter of 6 mm., white, with blue fibrils on the lower half, especially on the slightly spreading base; flesh white, solid (!). The flesh of the pileus white, except for a fuliginous tint immediately under the surface. Spores 9.3–11 × 5.5–6 μ. Cystidia usually bicornate.

Kauffman's statement that the stem in this species is not solid (Agaric. of Mich., p. 535) is not borne out by my material, nor is it supported by the original diagnosis and illustrations in Persoon's Icones et Descriptiones.

Stropharia aeruginosa var. **exsquamosa** n. var. (PL. 34, FIG. 1.)

Pileus about 3 cm. broad, convex, viscid, the center elevated, glabrous, green, the disk with a tinge of brown; margin white, even, appendiculate with fragments of the veil; flesh white throughout the plant. Gills purplish blue, broad, sinuate-adnate, close; edges finely crenate and whitish. Stem 4 cm. long, white, utterly devoid of squamules, merely slightly striate, 7 mm. thick, somewhat enlarged where the ring is attached, stuffed, then hollow. Ring superior, slight, white. Spores 6.6–7.3 × 4.8 μ.

Gunpowder River region, Baltimore Co., Md., September 27, 1919. No. *187*.

In drying, the whole plant turns yellow. It is not *S. albocyanea* Desm., a much slenderer plant.

TRICHOLOMA PANAEOLUM var. CAESPITOSUM Bres.

Baltimore, Md., near New Jerusalem, September 23, 1924. No. *1866*.

Found forming a huge fairy ring, 27 feet in diameter, around a spice bush (*Lindera Benzoin*). Rea says that *T. panaeolum* forms large rings in pastures (Brit. Basid., p. 238).

For the specimens, I am indebted to Prof. C. C. Plitt, the well-known lichenologist.

Tricholoma sejunctum var. **rubroscabrum** n. var. (PL. 33.)

Pileus 16 cm. broad, convex, with a broad uneven umbo, brownish yellow, the umbo dark reddish brown, virgate-rimose, toward the margin squamulose; margin persistently involute, much lobed. Gills rather broad, narrower toward the margin, pinkish creamy, close, unequal, sinuate; edges uneven. Stem 14 cm. long, 3 cm. thick above, enormously enlarged downward, about 6.5 cm. near the base, light pink, beautifully adorned throughout its length with conspicuous red scales; interior fibrous-solid. Flesh of pileus and stem pinkish, deeper in the former and there inclining to a brown pink. Spores 5.5 × 4 μ.

Boston, Mass., Blue Hills Reservation, September, 1911. No. *405*.

Except for the absence of the pink color and red scales of the stem, Schulz's plate of *T. sejunctum* var. *coryphaeum* (Fries) is a fairly close approximation to the present variety. (Schulz-Michael, Führer für Pilzfreunde, p. 23.) *T. Colossum* Fries, regarded by Boudier as an *Armillaria*, is related. (Bull. Soc. Myc. Fr. **16**: 18. 1900.)

Fries' *T. sejunctum*, being quite different from that of Sowerby, I venture to apply to it the new varietal name, **Tricholoma sejunctum** var. **Friesii.** Kauffman has already referred Peck's *T. intermedium* to Sowerby's species as a variety. We have thus four varieties of *T. sejunctum* Sowerby, viz., *Friesii*, *coryphaeum*, *intermedium*, and the present one, *rubroscabrum*.

T. Cisarnii Roum. is given as related to *T. coryphaeum*.

The plant commonly found in North America is Sowerby's type. *T. coryphaeum* has been reported but once. (Bull. 19, Boston Mycological Club. 1903.)

EXPLANATION OF PLATES

PLATE 31

Collybia maculata, abortive form.

PLATE 32

Fig. 1. *Amanita corticelli;* Fig. 2. *Amanita crassivolvata;* Fig. 2*a*, section.

PLATE 33

Tricholoma sejunctum var. *rubroscabrum.*

PLATE 34

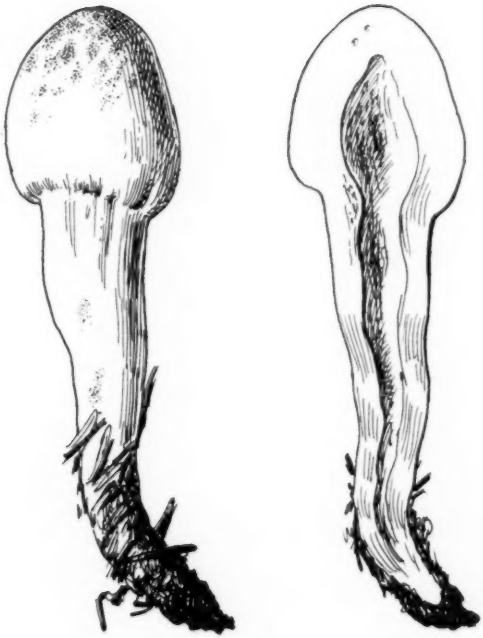
Fig. 1. *Stropharia aeruginosa* var. *exsquamosa;* Fig. 2. *Pluteus salicinus;* Fig. 2*a*, top view of the pileus; Fig. 2*b*, section; Fig. 3. *Hygrophorus proximus.*

PLATE 35

Cortinarius rubroclavus.

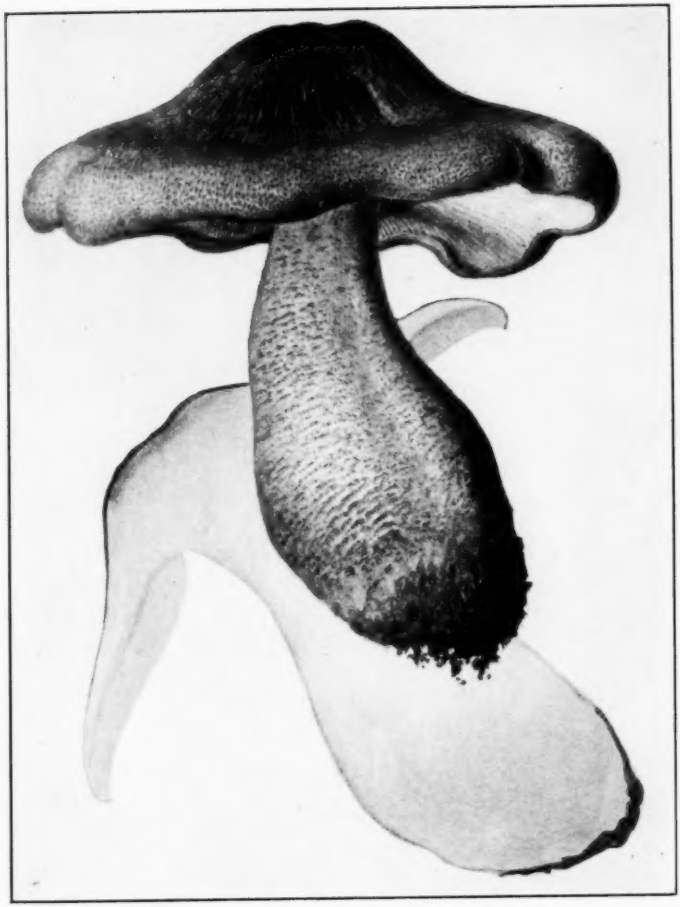
PLATE 36

Fig. 1. *Mycena inconspicua;* Fig. 1*a*, section; Fig. 2. *Agaricus auricolor* Fig. 3. *Pluteus leoninus* var. *oculatus;* Fig. 3*a*, section.

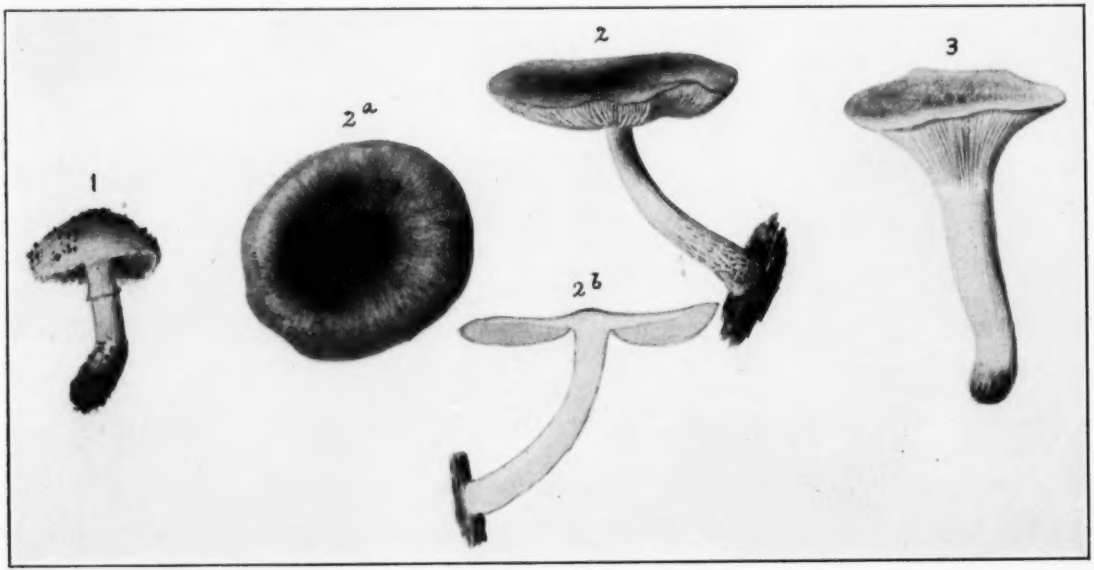


COLLYBIA MACULATA

1. AMANITA CORTICELLI
2. AMANITA CRASSIVOLVATA

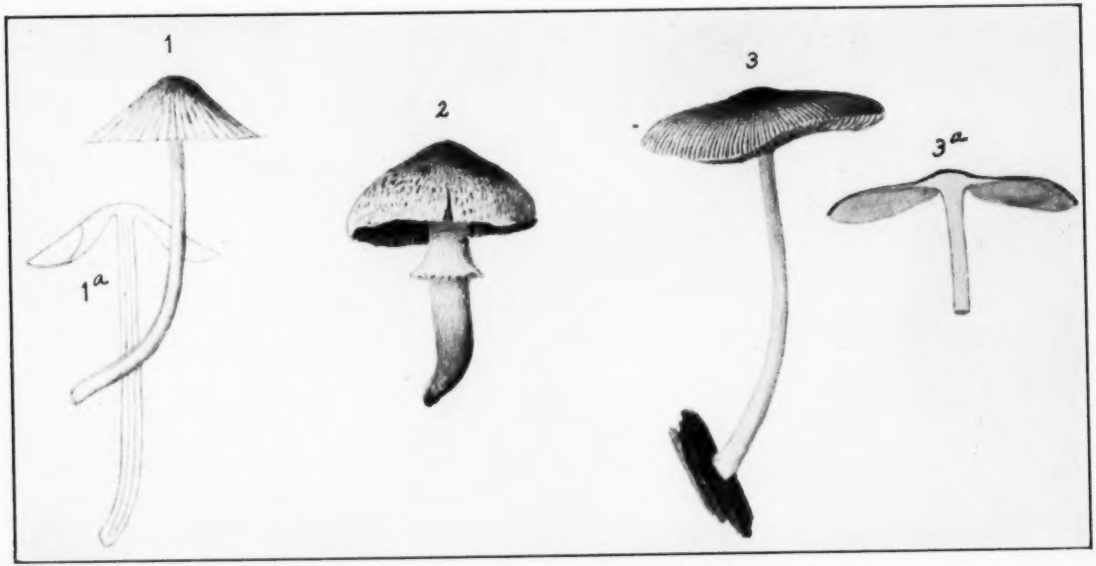


TRICHOLOMA SEJUNCTUM VAR. RUBROSCABRUM



1. STROPHARIA AERUGINOSA VAR. EXQUAMOSA
2. PLUTEUS SALICINUS. 3. HYGROPHORUS PROXIMUS

CORTINARIUS RUBROCLAVUS



1. MYCENA INCONSPICUA. 2. AGARICUS AURICOLOR
3. PLUTEUS LEONINUS VAR. OCULATUS

AN INTERESTING DISCOVERY OF A RARE SLIME-MOLD

ROBERT HAGELSTEIN

Enerthenema Berkeleyanum Rost. is one of the rarest of the Mycetozoa, or slime-molds, so rare, indeed, that but two occurrences have heretofore been recorded. It differs mainly from *Enerthenema papillatum* (Pers.) Rost., the only other species of the genus, in that the spores are clustered while in the latter species they are free. Several minor differences also exist.

The form with clustered spores was first recorded by Berkeley and Broome (Ann. Mag. Nat. Hist., II. **5**: 366) as occurring on boards from South Carolina. Rostafinski (Mon., App. p. 29, 1876), referring to this collection, which probably he had seen, established the species principally on the difference in spore structure. As Berkeley and Broome's description was not quite clear, Lister (Mon. Mycet. Ed. 2, p. 161, 1911), after an examination of the original specimen in the Kew Herbarium, concluded that the earlier students had been in error, and had mistaken the clustered spores of a parasitic fungus to be those of the slime-mold.

The existence of an *Enerthenema* with clustered spores was therefore in doubt until Sturgis (Myxo. Colo., II, p. 448, 1913) recorded from Colorado a second gathering, which he named *Enerthenema syncarpon*, discarding the name of Rostafinski. In the last edition of her work (Mon. Mycet. Ed. 3, p. 150, 1925), Miss Lister includes both gatherings as varietal to *E. papillatum*, with the variety name *syncarpon*.

For several years, the writer has been collecting the Mycetozoa growing in the vicinity of his home at Mineola, Nassau County, New York. In this work he has been assisted by Mr. Joseph Rispaud, an architect and builder, to whose keen eyesight was due the discovery of many rare or minute species. In the latter part of July 1926, while Mr. Rispaud was examining the spruce lath, recently nailed on the inside of the walls of a building he was

erecting in Mineola, he noticed on one of them what appeared to be a slime-mold. Examination with a hand-lens proved it to be an *Enerthenema*, and on going through the unused lath, many additional specimens were secured. White plasmodium was also present, and this fruited rapidly to maturity after removal to the writer's laboratory.

Study with the microscope revealed an *Enerthenema* similar to *E. papillatum*, but with spores in clusters of from four to eight or more. The spores measured from 12 to 13.5 μ in diameter. They were larger, darker, and more strongly spinulose than in *E. papillatum*. The sporangia were smaller, from .25 to .65 mm. in diameter, with shorter stalks, and more widely separated in habit. Generally, these are characters of the earlier gatherings.

An effort to trace the history of spore germination, and the growth of the plasmodium, which evidently did not occur at Mineola, resulted in the information that the lath had come from Nova Scotia. As the lath arrived on railroad cars only two days before the fruitings were observed, it is probable that germination occurred in Nova Scotia, the plasmodium feeding and growing on the fresh lumber there, and in transit.

This additional occurrence of an *Enerthenema* with clustered spores seems to make it unreasonable to further assume that Berkeley and Rostafinski, both distinguished students, should have erred in their observation of spore clusters in Berkeley's specimen. The question remains, is the character sufficient for specific distinction? In the genus *Badhamia*, the character is generally recognized as such. If so there, why not in the genus *Enerthenema*, and particularly as in this case we have other differences, of sporangium size, spore size and color, habit and possible habitat.

The writer agrees with Macbride (N. Am. Slime-Moulds, Ed. 2, p. 190, 1922) that *Enerthenema Berkeleyanum* Rost. is a distinct species, and by rule of priority should bear Rostafinski's name.

Specimens of the recent collection have been placed in the Herbarium of the New York Botanical Garden.

MINEOLA, NEW YORK

NOTES UPON REVIVING OLD CULTURES

ALFRED POVAH

The mere mechanics of keeping living cultures in the laboratory for any considerable time entails so much labor that scientists, busy with research or teaching or both, are forced to make one of two choices, *i.e.*, to turn over the work to an assistant or else allow the culture to die. Unfortunately, the first of these choices often brings about the same result as the second, for fungi vary considerably with regard to their ability to retain vitality in culture. On the one hand there are those exacting ones, like *Sporodinia grandis* Link, which require transferring about once in a fortnight; on the other, there are those fungi which may be neglected, as *Aspergillus Oryzae* (Ahlburg) Cohn, which can be allowed to go six months between transfers. Often the vagaries of a fungus are learned only by sad experience. Any means, therefore, of obviating transfers should be of assistance to many workers and thus the writer feels that this note may justify itself.

About two years ago repeated transfers of mycelium and sclerotia from an old culture of *Sclerotium Rolfsii* Sacc. gave no growth. As a last resort, before discarding the culture, hot agar was poured into the test tube. Within a few seconds the old dried sclerotia began to swell and in less than a minute became normal in size. The tube was then slanted and after cooling was placed in an incubator at 28 degrees C. In forty-eight hours abundant mycelium had developed and new sclerotia were beginning to form. It has been found that better results are obtained when a slight amount of agar is added, as growth rarely starts on the deeply submerged part of the fungus.

Since this first experiment the same procedure has been tried out on over a hundred cultures varying in age from three months to five years. In approximately forty per cent of these experiments growth has been resumed. By this method growth was obtained from a culture of *Sporodinia grandis* Link after five months, from a *Mucor* culture two years old and from a culture of

TABLE I

CULTURES SHOWING GROWTH AFTER ADDING HOT AGAR

Fungus	Age of Culture in		
	Yrs.	Mos.	Days
Absidia sp.		10	8
Aspergillus Oryzae (Ahlburg) Cohn	2	10	19
Aspergillus Oryzae	4	6	18
Botrytis sp.		10	6
C 2 (1)		8	29
C 3 (1)		8	29
C 7 (1)		8	29
C 17 (1)		8	29
Fusarium sp.	1	10	11
Fusarium sp.	1	11	22
Hypoxylon sp. (?)		8	15
Hypoxylon pruinatum (Klot.) Cooke	1	0	1
Hypoxylon pruinatum	1	10	7
Mucor christianiensis Hagem		3	3
Mucor christianiensis		7	17
Mucor circinelloides v. Tiegh.		3	3
Mucor circinelloides		6	8
Mucor griseo-cyanus Hagem		3	3
Mucor griseo-cyanus		6	29
Mucor hiemalis Wehmer		3	3
Mucor hiemalis		7	12
Mucor parvispora Kanouse		10	8
Mucor Ramannianus Möller		10	8
Mucor Ramannianus	1	1	8
Mucor sp.		7	0
Mucor sp.		5	16
Mucor sp. (2)		10	8
Mucor sp.	2	3	24
Mucor sp.	2	7	26
Mucor sp.		1	18
Mucor sp. (2)		2	6
Mucor sp. (2)		3	20
Penicillium sp.	2	10	17
Peronospora effusa Rabenh.		3	15
Phycomyces nitens Agarth (3)		3	18
Phycomyces nitens (3)		2	6
Phycomyces nitens (2)		2	2
Phycomyces nitens		7	19
Pythium sp.		11	6
Rhizopus nigricans Ehr. (−)		10	8
Rhizopus nigricans (−)		11	6
Rhizopus nigricans (+)		3	28
Rhizopus nigricans (−)		6	28
Rhizopus nigricans (−)		7	26
Sclerotinia Erythronii Whetzel (4)		11	5
Sclerotium Rolfsii Sacc.	4	6	9
Sclerotium Rolfsii	5	5	14
Sporodinia grandis Link		5	6

(1) Unidentified fungus isolated from *Cornus stolonifera* Michx.

(2) Two cultures.

(3) Three cultures.

(4) Identified by H. H. Whetzel.

Sclerotium Rolfsii over five years old. The writer does not wish to imply that this method can be relied upon but it is one that should be resorted to before old cultures are discarded. Some positive results are given in table I.

NORTHWESTERN UNIVERSITY,
EVANSTON, ILLINOIS

NOTES AND BRIEF ARTICLES

Bresadola's Iconographia Mycologica

In the opinion of Ellis, Peck, Lloyd, Weir, Overholts, Murrill, Kaufmann and many others, the Abbot Giacomo Bresadola is considered the greatest living authority on higher fungi. For this reason his name needs no introduction to the mycologists of America. To quote his own words, it is in the United States of America that he has found his greatest admirers and his best friends.

For the last fifty years G. Bresadola has dedicated all his time to the study of this one subject and in more than sixty publications (books and articles) has presented the fungi not only of all Europe but also of Camerun, Borneo, Java, the Philippine Islands, Australia, Patagonia, Brazil, Porto Rico, and the United States.

With his many and successful efforts to coördinate and simplify the systematic study of the fungi, Bresadola is carrying on the work of Fries and Persoon and may be considered the worthy successor of these great masters.

As a tribute of admiration to Bresadola on the occasion of his 80th birthday, the Italian Botanical Society has undertaken the publication of "Iconographia Mycologica." This work will consist of a summary of the observations of Bresadola and will comprise twenty volumes with a total of one thousand plates.

Three volumes are published and contained one hundred plates of "Agaricae leucosporae" (*Amanita*, *Lepiota*, *Schulzeria*, *Armillaria* and *Tricholoma*). The plates are reproductions in color of paintings made mostly by Bresadola. A few are painted by other artists under his direction. All are real works of art and are excellently reproduced. Each plate is accompanied by a clear, terse description in classical Latin, the universal language.

When the announcement of this book was sent out, the publishers received many subscriptions from every part of the world: from Japan to Brazil and from Sweden to South Africa. The

number of subscribers in the small cities in the province of Trento (Italy) alone was sixty-eight. From the United States of America up to March, 1927, only fourteen persons had subscribed.

In a country like the United States, where there is such a keen interest in the study of botany, it is difficult to understand why a publication of this kind has aroused so little interest. Possibly the meagre response can be explained by the fact that not sufficient publicity has been given to this work. Probably the schools, libraries and laboratories of America have not realized that this work is being published and that three volumes are already out and the fourth almost finished.

It is not only as a tribute to the modesty of the man or to the geniality of the author that this book should be acquired, but especially because it is a publication of supreme value, and will be a priceless asset in any collection of books on the subject.

Subscriptions may be sent to: Prof. G. B. Trener, Director of the Museum of Natural History, Trento (Italy), or G. E. Stechert, 31 E. 10th St., New York City. (Price $6.00 per volume.)

CARLO SAVINI

The Canadian Phytopathological Society will hold its winter meeting at Winnipeg in December, at which time Dr. J. C. Arthur of Purdue University will give an address.

MYCOPHAGIC NOTES

On the 19th of last September, 1926, I found a fair-sized Noctuid larva apparently feeding on the gills of a "death-cup," *Amanita verna*, into which it had eaten a cavity about twice the size of its head. I carefully boxed the fungus with the larva and brought it home to keep it under observation. To preserve the freshness of the fungus the box was put in a cool place—part of the time in a refrigerator. By the morning of the fifth day nearly a quarter of the gills had been rather superficially eaten over. The larva that morning was particularly active and persisted in attempts to get out of the box. In the evening it had half concealed itself between the volva and the stem of the fungus and was beginning to construct a cocoon. In November, I sent the pupa in its little volva house to Mr. J. J. de Gryse, Entomologist of the Canadian Division of Forest Insects. He writes me that on the 26th of January it emerged—a perfect specimen of *Chytonix palliatricula*. Apparently it had thriven on its death-cup diet. Can the physiologist explain how it is that a substance fatally toxic to frogs and higher animals is innocuous to the cutworm?

JOHN DEARNESS

LONDON, ONTARIO

THE GREEN-SPORED LEPIOTA

There are found among the numerous forms of mushrooms, sometimes gathered from our fields for table use, a few species that for some peculiar reason produce varying effects upon different people. The *Lepiota* which passes most commonly under the name *Lepiota Morgani* Peck, is one of these. This large and very striking plant has been described by some mycophagists as of excellent flavor and to be highly recommended. Others have eaten it with decidedly harmful consequences. The diversity of opinion that has developed has led to many trials, followed by enthusiastic approval or a call for the doctor, and further disagreements as to its use as a food. These will doubtless continue

till more is known about the fungus. From the numerous discomforting results it is evident that even the omnivorous consumer of the succulent dish must use care and discretion.

This species has long been considered a resident of our middle states that has wandered southward, and extended its abode to the warmer and congenial climate of our American tropics. As a matter of fact, it was first described by Meyer in 1818 from material gathered in the valley of the Essequibo, in British Guiana, under the name *Agaricus Molybdites*. For this reason it may be known as *Lepiota Molybdites* as well as *Lepiota Morgani*. Or, if one prefer placing it in a genus by itself because of its spores which are green at maturity instead of white, its name becomes *Chlorophyllum Molybdites* or *Chlorophyllum Morgani*, depending on whether the American or International Code is followed. Massee has also described the same mushroom as *Lepiota esculenta*, the edible *Lepiota*, from British Guiana. This, however, is not all the story, for Copeland (Ann. Myc. **3**: 28. 1905) also described the fungus, under the name *Lepiota chlorospora*, from the Philippine Islands, and but recently it has been reported by Parks (Univ. Cal. Publ. Bot. **12**: 53. 1926) under Copeland's name, from the Mahina District of Tahiti, where specimens were collected by Parks and Setchel in May, 1922. The species is unquestionably a native of the American tropics and the tropical islands of the Pacific. Like a number of other plants among the fungi, as well as seed-producing forms, it has spread from its original home, and is now found farther north in localities favorable for its maturity

During the month of August, 1912, I collected a number of specimens of this species on the open grassy lawn of the Lunetta, the Passeo of Manila, in the Philippines. On showing them to Dr. Copeland a few days later he told me they were identical with the species he had described as *Lepiota chlorospora*, and that they corresponded in all characteristics with his type material, which had been destroyed. The plants were growing in great profusion, forming large conspicuous fairy rings, the most perfect examples of this condition that I have ever seen. There were small rings but a few feet across and larger ones fully a rod in diameter. The grass within the circles was of a much darker

green than that outside, so that the areas were markedly conspicuous for some distance. The fungus was certainly at its best.

A party of four, desirous of having a mushroom meal, requested me to gather them sufficient of this particular kind. Copeland's description had included the statement that they were among the edible forms of the Islands, and but few species from the locality had been tested for this quality. It was with some hesitancy, and only after a warning, that I consented to procure material for the dinner. As the supply to choose from was so plentiful the gathering was restricted to plants of some size but with the pileus only about half expanded, a condition in which the spores were not mature and the gills still white or light colored. There were no specimens of any other species in the collection.

The next day I received a report on the meal and its consequences. Though described from the Islands as edible, the fact that few had been adventurous enough to try them added interest to the results. The person who had requested me to gather the mushrooms said that, so far as he was concerned, they were delicious and he had thoroughly enjoyed his meal, feeling no after effect of any kind. The other three had agreed during the meal that the mushrooms were of excellent flavor and that they had enjoyed eating them. It was not till later that gastronomic differences of opinion became manifest. One of the three felt some slight inconvenience but nothing very serious. He would have thought little of it, deeming it no more than a passing indisposition, probably a light attack of indigestion, if it had not been for the other two members of the party. The third member of the group was rendered quite ill, and it was feared for a time that the fourth might not live through the night, the effect upon him was so serious. By the aid of a doctor, however, he pulled through, and though weak from the effects was about again in a day or so.

In those cases of more mild effect, but severe enough to receive serious consideration, it is found that the first symptoms become evident from one to two hours after the mushrooms have been eaten. The first to make their appearance are dizziness followed by an uneasiness of the stomach. Sudden violent vomiting follows, the attacks of which may be repeated at intervals for abo ut

two hours or slightly longer. Each of these vomiting periods is preceded by a marked attack of cold sweat. Through the time occupied by the attacks of intermittent vomiting, and alternating with them, occasional chills are felt. A haziness or fogginess of the brain occurs throughout this period. Following the vomiting period a diarrhoeic attack occurs. This is usually of longer duration, and may last from three to four hours. After this, recovery to a normal condition may be rapid and no further effects felt.

In the more severe cases, such as that of the fourth person mentioned above, the same symptoms make their appearance. They show, however, a marked distinction. Instead of following one another as a sequence of events they are overlapping. They are also more violent, and may last for a longer time. Vomiting and purging may occur simultaneously or alternately, and are accompanied by alternating cold sweats and chills. Haziness of the brain and dizziness are more pronounced. The length of this attack depends upon the person and the amount eaten. As a result the patient is left in a very weak state. Recovery, however, seems to begin immediately after the thorough elimination of the contents of the alimentary tract. In spite of the violence of the case, no serious after effects are felt, and the recovery of the patient is complete.

The total immunity of some and the severity of the results upon others is hard to explain. As to the poisonous nature of this species there can be no doubt. Those who claim to have eaten this agaric with enjoyment and without later inconvenience are inclined to associate the trouble of others with their physical condition rather than lay the blame to the fungus. The probability is that the reverse is true. Those not affected are either resistant to or capable of counteracting in some manner the small amount of harmful toxin present. The symptoms certainly suggest a toxic action though the system is able to throw it off, and after the inconvenience has passed no further results are felt.

The genus *Lepiota* has, without a question, a close relationship with *Amanita*. In *Amanita* poisoning we find added symptoms and greater severity, but there seems to be at least a suggestion that the types of poisoning have something in common. *Lepiota* poisoning suggests a condition of intoxication and, at least in its

earlier stages, such a condition has likewise been suggested for *Amanita*. In fact a species of *Amanita* has been used in Siberia for the production of an intoxicating beverage. When used in this form it does not seem in the habit of causing fatal results, though *Amanita muscaria*, one of the most deadly species, is used. It might be pointed out that *Amanita* also includes edible species, but probably not as many as the genus *Lepiota*. Fortunately, so far as I am aware, no fatal consequences have been reported as having resulted from eating the green-spored *Lepiota*.

PAUL W. GRAFF

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New names and the final members of new combinations are in **bold face type**